

JAPANESE

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

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**CLAIMS**

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**[Claim(s)]**

[Claim 1] The inside of at least one client connected with the server through the network, It is boot program distribution equipment which distributes the boot program which said server holds to the client which rises. A multiple address transmitting means to transmit the boot program which said server holds by broadcast when starting in either of said at least one client is detected, In case it is assigned to said each at least one client and this client currently assigned is started Boot program distribution equipment characterized by providing at least one multiple address receiving means to receive the boot program transmitted by said multiple address transmitting means.

[Claim 2] It is boot program distribution equipment characterized by being boot program distribution equipment according to claim 1, and carrying out multiple-times transmission of said boot program by broadcast when said multiple address transmitting means detects starting in either of said at least one client.

[Claim 3] The inside of at least one client connected with the server through the network, It is boot program distribution equipment which distributes the boot program which said server holds to the client which rises. A multiple address transmitting means to divide the boot program which said server holds, to consider as two or more packets, and to transmit said two or more packets by broadcast when starting in either of said at least one client is detected, A retransmission-of-message authorization means to transmit the signal which shows the purport which can broadcast said packet again and which can be broadcast again by broadcast when transmission of two or more of said packets by this multiple address transmitting means is completed, At least one multiple address receiving means to receive two or more packets transmitted by said multiple address transmitting means in case it is assigned to said each at least one client and this client currently assigned is started, When the signal which was assigned to said each at least one client, and was transmitted by said retransmission-of-message authorization means and which can be broadcast again is received The existence of the packet which was not normally received by the multiple address receiving means currently assigned to the same client as self is detected. At least one retransmission-of-message demand means to transmit the retransmission-of-message demand signal which shows the purport which requires retransmission of message of the packet which was not received normally, A packet retransmission-of-message means to transmit the packet which this received retransmission-of-message demand signal shows when a retransmission-of-message demand signal is received from either of said at least one retransmission-of-message demand means, It is assigned to said each at least one client. Boot program distribution equipment characterized by providing at least one packet re-receiving means to receive the packet to which it retransmitted a message from said packet retransmission-of-message means since it was not normally received by the multiple address receiving means currently assigned to the same client as self.

[Claim 4] The storage which memorized the program for realizing the multiple address reception function to make the boot program transmitted by said multiple address transmitting function receive in case the client by which self is assigned to the computer with the multiple address transmitting function to which the boot program which a server holds is made to transmit by

broadcast when starting in either of at least one client is detected is started and in which computer reading is possible.

[Claim 5] It is the storage in which it is the storage which memorized the program according to claim 4, and in which computer reading is possible, and computer reading which memorized the program characterized by carrying out multiple-times transmission of said boot program by broadcast when said multiple address transmitting function detects starting in either of said at least one client is possible.

[Claim 6] When starting in either of at least one client is detected to a computer The multiple address transmitting function to which divide the boot program which a server holds, consider as two or more packets, and said two or more packets are made to transmit by broadcast, The retransmission-of-message authorization function to which the signal which shows the purport which can broadcast said packet again, and which can be broadcast again is made to transmit by broadcast when transmission of two or more of said packets by this multiple address transmitting function is completed, The multiple address reception function to make two or more packets transmitted by said multiple address transmitting function receive in case the client to which self is assigned is started, When the signal which was transmitted by said retransmission-of-message authorization function and which can be broadcast again is received The retransmission-of-message demand function to which the retransmission-of-message demand signal which shows the purport which requires retransmission of message of the packet which detected the existence of the packet which was not received normally and was not normally received by said multiple address reception function is made to transmit, The packet retransmission-of-message function to which the packet which this received retransmission-of-message demand signal shows is made to transmit when the retransmission-of-message demand signal transmitted by said retransmission-of-message demand function is received, The storage which memorized the program for realizing the packet re-reception function to make the packet to which it retransmitted a message from said packet retransmission-of-message function since it was not normally received by said multiple address reception function receive and in which computer reading is possible.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Field of the Invention] This invention relates to the storage which memorized the boot program distribution equipment and the program which transmit a boot program (starting program) through a network and in which computer reading is possible, when starting a calculating machine.

#### [0002]

[Description of the Prior Art] The common calculating machine holds beforehand the boot program which performs starting processing, and such a calculating machine rises uniquely.

[0003] On the other hand, although some [, such as an X terminal, and a diskless computer, a network computer (Network Computer), ] computers are equipped with CPU, memory, etc., for example, it does not have the hard disk holding a boot program. Therefore, such some calculating machines have the structure which acquires a boot program required for starting from another calculating machine via a network. Thus, it is called network boot to acquire a boot program from an alien machine through a network.

[0004] The usual network boot is performed by performing an one-to-one communication link between the computer holding a boot program, and the computer which rises.

[0005] Moreover, in this network boot, in order to investigate whether the exact boot program was distributed to the calculating machine which rises, a transmitting side is again answered from a receiving side in the contents after transmission.

[0006] Therefore, the traffic needed for the conventional network boot is calculated like (1) type.

[0007] Traffic = number x of computer (part of reply) 2 to boot-program capacity x Start — (1)

#### [0008]

[Problem(s) to be Solved by the Invention] As mentioned above, in the conventional network boot, when starting two or more calculating machines to coincidence, the communication link of a boot program is independently made, respectively between two or more of these calculating machines and the calculating machine which holds a boot program.

[0009] Computerization is attained in various industries in recent years, and network boot of two or more calculating machines may be performed to coincidence in accordance with the start time of business into it.

[0010] In this case, if these computers are connected to the same network, a network is saturated with the load by program transfer, and congestion may be started.

[0011] Network congestion causes communication link delay. Moreover, acquisition of a boot program may go wrong owing to network congestion, and starting may stop.

[0012] This invention mitigates network congestion and aims at offering the storage which memorized the boot program distribution equipment and the program which aim at the improvement in the speed and the improvement in dependability in boot program distribution and in which computer reading is possible by having been made in view of the above actual condition, and transmitting and receiving a boot program using broadcast.

#### [0013]

[Means for Solving the Problem] The main point of this invention is in the point which distributes a boot program to two or more clients using broadcast (broadcast).

[0014] The concrete means which was provided hereafter in realizing this invention is explained.

[0015] The inside of at least one client by which the 1st invention is connected with the server through the network, It is boot program distribution equipment which distributes the boot program which a server holds to the client which rises. A multiple address transmitting means to transmit the boot program which a server holds by broadcast when starting in either of at least one client is detected, In case it is assigned to each at least one client and this client currently assigned is started, it is boot program distribution equipment possessing at least one multiple address receiving means to receive the boot program transmitted by the multiple address transmitting means.

[0016] In the boot program distribution equipment of this 1st invention, a boot program is offered by broadcast to the client which rises.

[0017] Therefore, even when starting two or more clients to coincidence, the increment in the traffic accompanying boot program distribution can be reduced.

—[0018] Therefore, network congestion can be made to be able to mitigate and a client can be started at a high speed. Moreover, the dependability of boot program acquisition can be raised.

[0019] The 2nd invention is boot program distribution equipment of the 1st invention, and when a multiple address transmitting means detects starting in either of at least one client, it is boot program distribution equipment which carries out multiple-times transmission of the boot program by broadcast.

[0020] In the boot program distribution equipment of this 2nd invention, multiple-times transmission of the boot program is carried out by broadcast.

[0021] Thereby, even if a boot program is normally unreceivable with the first broadcast, a boot program is normally receivable with next broadcast. Therefore, the dependability of boot program acquisition can be raised further.

[0022] Moreover, even if it is the case where it is behind from starting of a certain client a little, and other clients are started, other clients can acquire a boot program.

[0023] The inside of at least one client by which the 3rd invention is connected with the server through the network, It is boot program distribution equipment which distributes the boot program which a server holds to the client which rises. A multiple address transmitting means to divide the boot program which a server holds, to consider as two or more packets, and to transmit two or more packets by broadcast when starting in either of at least one client is detected, A retransmission-of-message authorization means to transmit the signal which shows the purport which can broadcast a packet again and which can be broadcast again by broadcast when the transmission of two or more packets depended on this multiple address transmitting means is completed, At least one multiple address receiving means to receive two or more packets transmitted by the multiple address transmitting means in case it is assigned to each at least one client and this client currently assigned is started, When the signal which was assigned to each at least one client and transmitted by the retransmission-of-message authorization means and which can be broadcast again is received The existence of the packet which was not normally received by the multiple address receiving means currently assigned to the same client as self is detected. At least one retransmission-of-message demand means to transmit the retransmission-of-message demand signal which shows the purport which requires retransmission of message of the packet which was not received normally, A packet retransmission-of-message means to transmit the packet which this received retransmission-of-message demand signal shows when a retransmission-of-message demand signal is received from either of at least one retransmission-of-message demand means, It is assigned to each at least one client. Since it was not normally received by the multiple address receiving means currently assigned to the same client as self, it is boot program distribution equipment possessing at least one packet re-receiving means to receive the packet to which it retransmitted a message from the packet retransmission-of-message means.

[0024] In the boot program distribution equipment of this 3rd invention, although a boot program is divided into two or more packets and transmitted to a client from a server, it retransmits a

message only to the packet which was not normally received by the client side.

[0025] Therefore, even if abnormalities occur in distribution of a boot program, since it is restorable, the dependability of boot program acquisition can be raised further.

[0026] Furthermore, since restoration is carried out by the communication link of a packet unit even if abnormalities occur in distribution of a boot program, the traffic needed for a rehabilitation work can be reduced.

[0027] The 4th thru/or the 6th invention are storages which memorized the program for a computer to realize the function of the boot program distribution equipment explained by the 1st thru/or 3rd invention, respectively and in which computer reading is possible.

[0028] By using the storage which memorized such a program, the function simply mentioned above can be added also to the server and client which do not have the function mentioned above.

[0029]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained, referring to a drawing.

[0030] (Gestalt of the 1st operation) In the gestalt of this operation, the client by which starting is made by the same boot program is connected to a network, and when starting this client, the equipment which distributes the boot program of a server to a client using broadcast (broadcast) is explained.

[0031] In addition, broadcast is a communication mode which sends the same information and the same message to two or more locations from one certain location at coincidence.

[0032] Drawing 1 is the block diagram showing the configuration of the computer system equipped with the boot program distribution equipment concerning the gestalt of this operation.

[0033] A server 2 and clients 3-5 are connected possible [ transmission and reception ] through the network 6 in which broadcast is possible, and this computer system 1 is constituted.

[0034] The boot program distribution equipment concerning the gestalt of this operation is constituted by the multiple address receive sections 3b-5b with which multiple address transmitting section 2b with which the server 2 is equipped, and clients 3-5 are equipped.

[0035] A server 2 is equipped with the function which others for realizing store 2a, multiple address transmitting section 2b, and the function as a server do not illustrate. In addition, this function that is not illustrated has the function to detect the purport which may consider the function with which the conventional server is equipped, and the same function, for example, starts either of the clients 3-5 etc.

[0036] Store 2a memorizes the boot program 7 a client 3 - for 5 startings.

[0037] When starting of either of the clients 3-5 is detected in a server 2, multiple address transmitting section 2b reads the boot program in store 2a, divides it into a program fragment, and creates a packet. And the created packet is transmitted to clients 3-5 using broadcast.

[0038] Failure of transmission and reception of a packet is equipped with this multiple address transmitting section 2b, and it carries out multiple-times (for example, about 3 times) transmission of the same packet. In addition, when it is checked that the boot program 7 had been distributed to all the clients that perform the case where a user etc. checks that all the clients that rise, for example had started, and starting, the packet transmission from multiple address transmitting section 2b may be stopped at the time.

[0039] Oneselves, such as an X terminal, and a diskless calculating machine, a network computer, are the calculating machines which do not hold the boot program, and clients 3-5 are calculating machines by which each is started by the same boot program 7.

[0040] Each clients 3-5 are equipped with the function which Memory 3a-5a, the multiple address receive sections 3b-5b, and others for realizing the function as a client started by network boot do not illustrate, respectively. In addition, this function that is not illustrated has the function which notifies the purport as which you may consider the function with which the conventional client is equipped, and the same function, for example, self starting is demanded to a server 2.

[0041] Memory 3a-5a is equipment for holding the distributed boot program 7. By the boot program 7 stored in this memory 3a-5a being performed, starting of each clients 3-5 is made.

[0042] It will be assigned to clients 3-5 by each being installed by the multiple address receive sections 3b-5b, respectively, and when starting the clients 3-5 currently assigned, respectively, they receive the packet transmitted by broadcast. And a boot program 7 is compounded from the packet which received, and it stores in Memory 3a-5a.

[0043] Moreover, when two or more same packets are received, the multiple address receive sections 3b-5b choose a normal packet out of the same packet in the case of boot program 7 composition, and try composition of a boot program 7. And when a boot program 7 is able to be compounded normally, synthetic completion is notified to multiple address transmitting section 2b.

[0044] Actuation of the computing system 1 equipped with the boot program distribution equipment which has the above configurations is explained below.

[0045] For example, although the power source of clients 3 and 4 was newly switched on with initiation of business, a client 5 presupposes that they are already starting ending or a idle state.

[0046] In this case, the acquisition demand of a boot program 7 is made by the clients 3 and 4 which rise, and this acquisition demand is detected at a server 2.

[0047] Then, multiple address transmitting section 2b of a server 2 is started, and the boot program 7 in store 2a is read with this multiple address transmitting section 2b.

[0048] It is decomposed into plurality, a packet is created and the boot program 7 read into this multiple address transmitting section 2b is transmitted using broadcast. Multiple-times activation of this broadcast is carried out.

[0049] In addition, two or more of these packets are transmitted by broadcast for the clients 3-5 by which starting is made by this boot program 7. For this reason, although two or more packets are ability ready for receiving also in any of clients 3-5, the multiple address receive sections 3b-5b demonstrate the reception function of two or more packets, only when starting the clients 3-5 to which each is assigned.

[0050] Therefore, two or more packets are received in the multiple address receive sections 3b and 4b of clients 3 and 4 which rise.

[0051] In these multiple address receive sections 3b and 4b, a boot program 7 is compounded based on two or more packets which received. In addition, a normal packet is chosen and compounded when two or more same packets are received in the case of composition.

[0052] Thus, the boot program 7 compounded by the multiple address receive sections 3b and 4b is memorized by Memory 3a and 3b.

[0053] In addition, when a boot program 7 makes the purport compounded normally detect and is normally compounded in the multiple address receive sections 3b and 4b, respectively, multiple address transmitting section 2b is made to notify synthetic completion of a boot program 7 from the multiple address receive sections 3b and 4b. In multiple address transmitting section 2b, if the notice of this synthetic completion is received from all the acquisition demand origin of a boot program 7, broadcast will be suspended.

[0054] Thereby, even if it is the case where multiple-times transmission of the packet is carried out by broadcast, an unnecessary communication link can be lost.

[0055] Clients 3 and 4 rise using the boot program 7 in this memory 3a and 3b.

[0056] As explained above, in the boot program distribution equipment concerning the gestalt of this operation, broadcast of the boot program 7 is carried out through a network between multiple address transmitting section 2b and the multiple address receive sections 3b-5b.

[0057] Even if the traffic needed when performing network boot using this boot program distribution equipment is many cases, it becomes like (2) types.

[0058]

Traffic = count of a boot program capacity x communication link — (2)

The traffic calculated by this (2) formula is reduced more sharply than the traffic needed by the conventional network boot called for by (1) formula.

[0059] Therefore, it can prevent a network being saturated with applying the boot program distribution equipment concerning the gestalt of this operation by transfer of a boot program, and starting congestion by it. Moreover, delay of a communication link can be prevented, it can prevent that the abnormalities of boot program acquisition and starting of a client go wrong, and

dependability can be raised.

[0060] Moreover, if the boot program distribution equipment concerning the gestalt of this operation is applied, since the reply to a server from a client will not be made, the turbulence over a communication link can be reduced and a network specification situation can be raised.

[0061] Furthermore, in the boot program distribution equipment concerning the gestalt of this operation, since multiple-times transmission of the boot program is carried out, the dependability of boot program distribution can be raised further. Moreover, even if it is the case where it is behind from starting of a certain client a little, and other clients are started, other clients can acquire a boot program.

[0062] Even if it is on the other hand before completing transmission of multiple times, when a boot program is distributed normally, traffic can be made to reduce further by stopping a communication link.

[0063] (Gestalt of the 2nd operation) In the gestalt of this operation, although two or more packets which divided the boot program and were created are transmitted by broadcast, the packet which abnormalities generated at the time of a transfer is detected, and the boot program distribution equipment which broadcasts only this unusual packet again is explained.

[0064] Drawing 2 is the block diagram showing the configuration of the computer system equipped with the boot program distribution equipment concerning the gestalt of this operation. It considers as \*\* which gives the same sign to the same element as drawing 1 in this drawing 2, and that explanation is omitted.

[0065] A server 9 and Clients 101-10n are connected possible [ transmission and reception ] through a network 6, and the computer system 8 is constituted.

[0066] The boot program distribution equipment concerning the gestalt of this operation is constituted by multiple address transmitting section 9b and packet retransmission-of-message section 9c with which the server 9 is equipped, and the multiple address receive section 11 and the re-receiving device 12 with which Clients 101-10n are equipped. Here, the retransmission-of-message authorization section 13 is contained in multiple address transmitting section 9b, and the re-receiving device 12 is constituted by the retransmission-of-message demand section 14 and the packet re-receive section 15.

[0067] In addition, the clients 101-10n in this drawing 2 are computers which start by the same boot program 7, and since they have same configuration and operation, they are mainly explained using a client 101 below.

[0068] If multiple address transmitting section 9b detects Clients [ 101-10n ] either starting, it will divide a boot program 7 into plurality, will create a packet, will attach identification information, and will transmit using broadcast. Here, the number of partitions and sequence of a boot program 7 are used as identification information. For example, when a boot program 7 is divided into 100 pieces, identification information "1/100", "2/100", —, "100/100" are added sequentially from a top packet, respectively.

[0069] Moreover, this multiple address transmitting section 9b transmits a retransmission-of-message enabling signal by broadcast with the retransmission-of-message authorization section 13, after transmitting all the created packets. This retransmission-of-message enabling signal is a signal for notifying the purport which can broadcast a packet again.

[0070] It will be assigned to the client 101 by self being installed by the multiple address receive section 11, and when starting the client 101 currently assigned, it receives the packet transmitted by broadcast. Moreover, composition of a boot program 7 is tried from the packet which received. Here, when the packet of the abnormalities in a communication link in case abnormalities are in the contents of the packet which received when there was a packet which is not received [ for example, ] exists, a normal packet is inputted from the packet re-receive section 15, and a boot program 7 is compounded only by the normal packet. And the compounded boot program 7 is stored in memory 3a.

[0071] The retransmission-of-message demand section 14 receives the retransmission-of-message enabling signal transmitted by broadcast, when starting a client 101. Moreover, reception of this retransmission-of-message enabling signal detects whether the packet of the abnormalities in a communication link is in this packet with reference to the packet received in

the multiple address receive section 11. And when there are abnormalities in a communication link, the identification information of the packet leading to this abnormality is included in a retransmission-of-message demand signal, and this retransmission-of-message demand signal is transmitted to packet retransmission-of-message section 9c of a server 9.

[0072] If a retransmission-of-message demand signal is received from the retransmission-of-message demand section 14, packet retransmission-of-message section 9c will read a boot program 7, and will create a packet by the same technique as multiple address transmitting section 9b. And the packet concerning the identification information contained in the received retransmission-of-message demand signal is transmitted to the packet re-receive section 15 of a client 101.

[0073] The packet re-receive section 15 receives a retransmission-of-message packet from packet retransmission-of-message section 9c, and outputs this retransmission-of-message packet that received to the multiple address receive section 11.

[0074] Actuation of the computing system 8 equipped with the boot program distribution equipment which has the above configurations is explained below.

[0075] Drawing 3 is drawing showing the actuation performed between server 2a of this computer system, and a client 101.

[0076] If a power source is newly switched on in Clients [ 101-10n ] either, first, a boot program 7 will be read by multiple address transmitting section 9b by the side of a server 9, and packet "1/100" - "100/100" will be created.

[0077] And if this packet "1/100" - "100/100" is transmitted by multiple address transmitting section 9b by the side of a server 9 using broadcast, it will be received in the multiple address receive section 11 by the side of a client 101. However, suppose that the packet "55/100" was lost at the time of this communication link.

[0078] Moreover, after packet "1/100" - "100/100" is transmitted by multiple address transmitting section 9b by the side of a server 9, the signal which can be broadcast again is transmitted from the retransmission-of-message authorization section 13 using broadcast.

[0079] Reception of the signal which can be broadcast again of the retransmission-of-message demand section 14 by the side of a client 101 lists the packet received by the multiple address receive section 11 by this retransmission-of-message demand section 14. Thereby, the purport which the packet "55/100" has lost is detected by the retransmission-of-message demand section 14.

[0080] Then, the retransmission-of-message demand signal of the purport which broadcasts a packet "55/100" again is transmitted by the retransmission-of-message demand section 14 by the side of a client 101.

[0081] A retransmission-of-message demand signal is received by the server 9 side, and packet retransmission-of-message section 9c retransmits a message to a packet "55/100" at it based on this retransmission-of-message demand signal.

[0082] It is received by the packet re-receive section 15, and the packet "55/100" to which it retransmitted a message at the client 101 side is outputted to the multiple address receive section 11 after that.

[0083] And the packet again received by the multiple address receive section 11 by the retransmission-of-message demand section 14 is listed, as a result, all reception is checked, and composition of a boot program 7 is made by the multiple address receive section 11.

[0084] As explained above, in the boot program distribution equipment concerning the gestalt of this operation, two or more packets are created from a boot program 7, and it transmits using broadcast. Here, when the packet which did not communicate normally is detected, a client 101 retransmits a message only to this packet that did not communicate normally from a server 9.

[0085] That is, this boot program distribution equipment requires only the packet in which this communication link failed of a server 9, when the communication link of a boot program 7 goes wrong partially. Here, the retransmission-of-message demand from a client 101 is performed after the retransmission-of-message authorization from a server 9 is transmitted.

[0086] Thus, what is necessary is not to repeat transmission of a boot program 7 two or more times, in order to secure a normal communication link, and to broadcast again only the packet by

which the unusual communication link was made, if the boot program distribution equipment concerning the gestalt of this operation is used.

[0087] Therefore, in the boot program distribution equipment concerning the gestalt of this operation, traffic can be made to be able to reduce further rather than the case where the gestalt of the 1st operation describes, and the turbulence by the client 101 can be prevented. Moreover, thereby, the dependability of starting of a computing system can be raised further.

[0088] In addition, the signal in the gestalt of this operation which can be broadcast again may be used as "boot authorization" to the client which the communication link of a packet has completed normally.

[0089] Moreover, in the gestalt of this operation, it is supposed that the retransmission-of-message demand section 14 will detect transmitting abnormalities with reference to the identification information of the packet received by the multiple address receive section 11. However, it replaces with this and the both sides of the multiple address receive section 11 and the retransmission-of-message demand section 14 presuppose that it is a packet ability ready for receiving, and though the retransmission-of-message demand section 14 detects the abnormalities in a communication link using the identification information of the packet which self received, it is good.

[0090] In the gestalt of each above-mentioned implementation, although the case where it is built in the server and client from which each component of boot program distribution equipment constitutes a computer system is explained as an example, though it is not limited to this and external is carried out to a server and a client, it is good.

[0091] Moreover, in the gestalt of each above-mentioned implementation, although all are made into the transmission place of broadcast if it is the client which starts by the same boot program, it is not limited to this. For example, it is the client which starts by the same boot program, and it is good though a boot program is transmitted only for the client as which starting was required in predetermined time amount as an object of the transmission place of broadcast.

[0092] (Gestalt of the 3rd operation) As a program which a computer can be made to execute, write in storages, such as magnetic disks (a floppy disk, hard disk, etc.), optical disks (CD-ROM, DVD, etc.), and semiconductor memory, and it applies, or it transmits by communication media, and each function of the boot program distribution equipment concerning the gestalt of each operation explained above can also be applied to various equipments. The computer which realizes each above-mentioned function performs processing mentioned above by reading the program memorized by the storage and controlling actuation by the program.

[0093] For example, the 1st program which realizes the function of multiple address transmitting section 2b shown in drawing 1, and the 2nd program which realizes the function of multiple address receive section 3b are memorized to a storage.

[0094] If a user installs this 1st program in a server 2 and the 2nd program is installed in each clients 3-5, he can realize the same situation as the case where the boot program distribution equipment concerning the gestalt of the 1st operation is applied.

[0095] Moreover, the 3rd program which realizes the function of multiple address transmitting section 9b which contains the retransmission-of-message authorization section 13 shown in drawing 2, for example, the 4th program which realizes the function of packet retransmission-of-message section 9c, the 5th program which realizes the function of the multiple address receive section 11, and the 6th program which realizes the function of the re-receiving device 12 are memorized to a storage.

[0096] If a user installs these 3rd and 4th programs in a server 9 and the 5th and 6th programs are installed in each clients 101-10n, he can realize the same situation as the case where the boot program distribution equipment concerning the gestalt of the 2nd operation is applied.

[0097]

[Effect of the Invention] As a full account was given above, in case the client which does not hold a boot program is started in this invention, a boot program is distributed to a client from a server using broadcast.

[0098] Thereby, when many clients must be started to coincidence, traffic can be decreased rather than it distributes a boot program according to an individual at each client.

[0099] Therefore, it can prevent a network being saturated and starting congestion by boot program distribution. Moreover, it can prevent that delay of a communication link occurs by network congestion, and failure in acquisition of a boot program and a halt of starting occur.

Furthermore, boot program distribution for client starting can be performed at a high speed.

[0100] Moreover, in this invention, the dependability of starting of a client can be further raised by repeating broadcast two or more times.

[0101] Furthermore, a boot program is divided into plurality and a packet is created, and identification information is added to each of this packet, it transmits by broadcast, the abnormalities in a communication link are detected from the identification information of a packet at a reception place, and only the packet used as abnormalities is made to broadcast again in this invention.

[0102] It is good to perform broadcast by this, that what is necessary is to resend only the part which went wrong, even if the communication link of a part of boot program goes wrong only at once. Therefore, the throughput and traffic of a client and a server can be decreased, and the turbulence by the client can be prevented.

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TECHNICAL FIELD

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**PRIOR ART**

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[Description of the Prior Art] The common calculating machine holds beforehand the boot program which performs starting processing, and such a calculating machine rises uniquely.

[0003] On the other hand, although some [, such as an X terminal, and a diskless computer, a network computer (Network Computer), ] computers are equipped with CPU, memory, etc., for example, it does not have the hard disk holding a boot program. Therefore, such some calculating machines have the structure which acquires a boot program required for starting from another calculating machine via a network. Thus, it is called network boot to acquire a boot program from an alien machine through a network.

[0004] The usual network boot is performed by performing an one-to-one communication link between the computer holding a boot program, and the computer which rises.

[0005] Moreover, in this network boot, in order to investigate whether the exact boot program was distributed to the calculating machine which rises, a transmitting side is again answered from a receiving side in the contents after transmission.

[0006] Therefore, the traffic needed for the conventional network boot is calculated like (1) type.

[0007] Traffic = number x of computer (part of reply) 2 to boot-program capacity x Start — (1)

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[Translation done.]

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] As a full account was given above, in case the client which does not hold a boot program is started in this invention, a boot program is distributed to a client from a server using broadcast.

[0098] Thereby, when many clients must be started to coincidence, traffic can be decreased rather than it distributes a boot program according to an individual at each client.

[0099] Therefore, it can prevent a network being saturated and starting congestion by boot program distribution. Moreover, it can prevent that delay of a communication link occurs by network congestion, and failure in acquisition of a boot program and a halt of starting occur. Furthermore, boot program distribution for client starting can be performed at a high speed.

[0100] Moreover, in this invention, the dependability of starting of a client can be further raised by repeating broadcast two or more times.

[0101] Furthermore, a boot program is divided into plurality and a packet is created, and identification information is added to each of this packet, it transmits by broadcast, the abnormalities in a communication link are detected from the identification information of a packet at a reception place, and only the packet used as abnormalities is made to broadcast again in this invention.

[0102] It is good to perform broadcast by this, that what is necessary is to resend only the part which went wrong, even if the communication link of a part of boot program goes wrong only at once. Therefore, the throughput and traffic of a client and a server can be decreased, and the turbulence by the client can be prevented.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] As mentioned above, in the conventional network boot, when starting two or more calculating machines to coincidence, the communication link of a boot program is independently made, respectively between two or more of these calculating machines and the calculating machine which holds a boot program.

[0009] Computerization is attained in various industries in recent years, and network boot of two or more calculating machines may be performed to coincidence in accordance with the start time of business into it.

[0010] In this case, if these computers are connected to the same network, a network is saturated with the load by program transfer, and congestion may be started.

[0011] Network congestion causes communication link delay. Moreover, acquisition of a boot program may go wrong owing to network congestion, and starting may stop.

[0012] This invention mitigates network congestion and aims at offering the storage which memorized the boot program distribution equipment and the program which aim at the improvement in the speed and the improvement in dependability in boot program distribution and in which computer reading is possible by having been made in view of the above actual condition, and transmitting and receiving a boot program using broadcast.

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{ [Translation done.]

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**MEANS**

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[Means for Solving the Problem] The main point of this invention is in the point which distributes a boot program to two or more clients using broadcast (broadcast).

[0014] The concrete means which was provided hereafter in realizing this invention is explained.

[0015] The inside of at least one client by which the 1st invention is connected with the server through the network, It is boot program distribution equipment which distributes the boot program which a server holds to the client which rises. A multiple address transmitting means to transmit the boot program which a server holds by broadcast when starting in either of at least one client is detected, In case it is assigned to each at least one client and this client currently assigned is started, it is boot program distribution equipment possessing at least one multiple address receiving means to receive the boot program transmitted by the multiple address transmitting means.

[0016] In the boot program distribution equipment of this 1st invention, a boot program is offered by broadcast to the client which rises.

[0017] Therefore, even when starting two or more clients to coincidence, the increment in the traffic accompanying boot program distribution can be reduced.

[0018] Therefore, network congestion can be made to be able to mitigate and a client can be started at a high speed. Moreover, the dependability of boot program acquisition can be raised.

[0019] The 2nd invention is boot program distribution equipment of the 1st invention, and when a multiple address transmitting means detects starting in either of at least one client, it is boot program distribution equipment which carries out multiple-times transmission of the boot program by broadcast.

[0020] In the boot program distribution equipment of this 2nd invention, multiple-times transmission of the boot program is carried out by broadcast.

[0021] Thereby, even if a boot program is normally unreceivable with the first broadcast, a boot program is normally receivable with next broadcast. Therefore, the dependability of boot program acquisition can be raised further.

[0022] Moreover, even if it is the case where it is behind from starting of a certain client a little, and other clients are started, other clients can acquire a boot program.

[0023] The inside of at least one client by which the 3rd invention is connected with the server through the network, It is boot program distribution equipment which distributes the boot program which a server holds to the client which rises. A multiple address transmitting means to divide the boot program which a server holds, to consider as two or more packets, and to transmit two or more packets by broadcast when starting in either of at least one client is detected, A retransmission-of-message authorization means to transmit the signal which shows the purport which can broadcast a packet again and which can be broadcast again by broadcast when the transmission of two or more packets depended on this multiple address transmitting means is completed, At least one multiple address receiving means to receive two or more packets transmitted by the multiple address transmitting means in case it is assigned to each at least one client and this client currently assigned is started, When the signal which was assigned to each at least one client and transmitted by the retransmission-of-message authorization means and which can be broadcast again is received The existence of the packet which was not

normally received by the multiple address receiving means currently assigned to the same client as self is detected. At least one retransmission-of-message demand means to transmit the retransmission-of-message demand signal which shows the purport which requires retransmission of message of the packet which was not received normally. A packet retransmission-of-message means to transmit the packet which this received retransmission-of-message demand signal shows when a retransmission-of-message demand signal is received from either of at least one retransmission-of-message demand means. It is assigned to each at least one client. Since it was not normally received by the multiple address receiving means currently assigned to the same client as self, it is boot program distribution equipment possessing at least one packet re-receiving means to receive the packet to which it retransmitted a message from the packet retransmission-of-message means.

[0024] In the boot program distribution equipment of this 3rd invention, although a boot program is divided into two or more packets and transmitted to a client from a server, it retransmits a message only to the packet which was not normally received by the client side.

[0025] Therefore, even if abnormalities occur in distribution of a boot program, since it is restorable, the dependability of boot program acquisition can be raised further.

[0026] Furthermore, since restoration is carried out by the communication link of a packet unit even if abnormalities occur in distribution of a boot program, the traffic needed for a rehabilitation work can be reduced.

[0027] The 4th thru/or the 6th invention are storages which memorized the program for a computer to realize the function of the boot program distribution equipment explained by the 1st thru/or 3rd invention, respectively and in which computer reading is possible.

[0028] By using the storage which memorized such a program, the function simply mentioned above can be added also to the server and client which do not have the function mentioned above.

[0029]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained, referring to a drawing.

[0030] (Gestalt of the 1st operation) In the gestalt of this operation, the client by which starting is made by the same boot program is connected to a network, and when starting this client, the equipment which distributes the boot program of a server to a client using broadcast (broadcast) is explained.

[0031] In addition, broadcast is a communication mode which sends the same information and the same message to two or more locations from one certain location at coincidence.

[0032] Drawing 1 is the block diagram showing the configuration of the computer system equipped with the boot program distribution equipment concerning the gestalt of this operation.

[0033] A server 2 and clients 3-5 are connected possible [ transmission and reception ] through the network 6 in which broadcast is possible, and this computer system 1 is constituted.

[0034] The boot program distribution equipment concerning the gestalt of this operation is constituted by the multiple address receive sections 3b-5b with which multiple address transmitting section 2b with which the server 2 is equipped, and clients 3-5 are equipped.

[0035] A server 2 is equipped with the function which others for realizing store 2a, multiple address transmitting section 2b, and the function as a server do not illustrate. In addition, this function that is not illustrated has the function to detect the purport which may consider the function with which the conventional server is equipped, and the same function, for example, starts either of the clients 3-5 etc.

[0036] Store 2a memorizes the boot program 7 a client 3 - for 5 startings.

[0037] When starting of either of the clients 3-5 is detected in a server 2, multiple address transmitting section 2b reads the boot program in store 2a, divides it into a program fragment, and creates a packet. And the created packet is transmitted to clients 3-5 using broadcast.

[0038] Failure of transmission and reception of a packet is equipped with this multiple address transmitting section 2b, and it carries out multiple-times (for example, about 3 times) transmission of the same packet. In addition, when it is checked that the boot program 7 had been distributed to all the clients that perform the case where a user etc. checks that all the

clients that rise, for example had started, and starting, the packet transmission from multiple address transmitting section 2b may be stopped at the time.

[0039] Oneselves, such as an X terminal, and a diskless calculating machine, a network computer, are the calculating machines which do not hold the boot program, and clients 3-5 are calculating machines by which each is started by the same boot program 7.

[0040] Each clients 3-5 are equipped with the function which Memory 3a-5a, the multiple address receive sections 3b-5b, and others for realizing the function as a client started by network boot do not illustrate, respectively. In addition, this function that is not illustrated has the function which notifies the purport as which you may consider the function with which the conventional client is equipped, and the same function, for example, self starting is demanded to a server 2.

[0041] Memory 3a-5a is equipment for holding the distributed boot program 7. By the boot program 7 stored in this memory 3a-5a being performed, starting of each clients 3-5 is made.

[0042] It will be assigned to clients 3-5 by each being installed by the multiple address receive sections 3b-5b, respectively, and when starting the clients 3-5 currently assigned, respectively, they receive the packet transmitted by broadcast. And a boot program 7 is compounded from the packet which received, and it stores in Memory 3a-5a.

[0043] Moreover, when two or more same packets are received, the multiple address receive sections 3b-5b choose a normal packet out of the same packet in the case of boot program 7 composition, and try composition of a boot program 7. And when a boot program 7 is able to be compounded normally, synthetic completion is notified to multiple address transmitting section 2b.

[0044] Actuation of the computing system 1 equipped with the boot program distribution equipment which has the above configurations is explained below.

[0045] For example, although the power source of clients 3 and 4 was newly switched on with initiation of business, a client 5 presupposes that they are already starting ending or a idle state.

[0046] In this case, the acquisition demand of a boot program 7 is made by the clients 3 and 4 which rise, and this acquisition demand is detected at a server 2.

[0047] Then, multiple address transmitting section 2b of a server 2 is started, and the boot program 7 in store 2a is read with this multiple address transmitting section 2b.

[0048] It is decomposed into plurality, a packet is created and the boot program 7 read into this multiple address transmitting section 2b is transmitted using broadcast. Multiple-times activation of this broadcast is carried out.

[0049] In addition, two or more of these packets are transmitted by broadcast for the clients 3-5 by which starting is made by this boot program 7. For this reason, although two or more packets are ability ready for receiving also in any of clients 3-5, the multiple address receive sections 3b-5b demonstrate the reception function of two or more packets, only when starting the clients 3-5 to which each is assigned.

[0050] Therefore, two or more packets are received in the multiple address receive sections 3b and 4b of clients 3 and 4 which rise.

[0051] In these multiple address receive sections 3b and 4b, a boot program 7 is compounded based on two or more packets which received. In addition, a normal packet is chosen and compounded when two or more same packets are received in the case of composition.

[0052] Thus, the boot program 7 compounded by the multiple address receive sections 3b and 4b is memorized by Memory 3a and 3b.

[0053] In addition, when a boot program 7 makes the purport compounded normally detect and is normally compounded in the multiple address receive sections 3b and 4b, respectively, multiple address transmitting section 2b is made to notify synthetic completion of a boot program 7 from the multiple address receive sections 3b and 4b. In multiple address transmitting section 2b, if the notice of this synthetic completion is received from all the acquisition demand origin of a boot program 7, broadcast will be suspended.

[0054] Thereby, even if it is the case where multiple-times transmission of the packet is carried out by broadcast, an unnecessary communication link can be lost.

[0055] Clients 3 and 4 rise using the boot program 7 in this memory 3a and 3b.

[0056] As explained above, in the boot program distribution equipment concerning the gestalt of this operation, broadcast of the boot program 7 is carried out through a network between multiple address transmitting section 2b and the multiple address receive sections 3b-5b.

[0057] Even if the traffic needed when performing network boot using this boot program distribution equipment is many cases, it becomes like (2) types.

[0058]

Traffic = count of a boot program capacity x communication link — (2)

The traffic calculated by this (2) formula is reduced more sharply than the traffic needed by the conventional network boot called for by (1) formula.

[0059] Therefore, it can prevent a network being saturated with applying the boot program distribution equipment concerning the gestalt of this operation by transfer of a boot program, and starting congestion by it. Moreover, delay of a communication link can be prevented, it can prevent that the abnormalities of boot program acquisition and starting of a client go wrong, and dependability can be raised.

[0060] Moreover, if the boot program distribution equipment concerning the gestalt of this operation is applied, since the reply to a server from a client will not be made, the turbulence over a communication link can be reduced and a network specification situation can be raised.

[0061] Furthermore, in the boot program distribution equipment concerning the gestalt of this operation, since multiple-times transmission of the boot program is carried out, the dependability of boot program distribution can be raised further. Moreover, even if it is the case where it is behind from starting of a certain client a little, and other clients are started, other clients can acquire a boot program.

[0062] Even if it is on the other hand before completing transmission of multiple times, when a boot program is distributed normally, traffic can be made to reduce further by stopping a communication link.

[0063] (Gestalt of the 2nd operation) In the gestalt of this operation, although two or more packets which divided the boot program and were created are transmitted by broadcast, the packet which abnormalities generated at the time of a transfer is detected, and the boot program distribution equipment which broadcasts only this unusual packet again is explained.

[0064] Drawing 2 is the block diagram showing the configuration of the computer system equipped with the boot program distribution equipment concerning the gestalt of this operation. It considers as \*\* which gives the same sign to the same element as drawing 1 in this drawing 2, and that explanation is omitted.

[0065] A server 9 and Clients 101-10n are connected possible [ transmission and reception ] through a network 6, and the computer system 8 is constituted.

[0066] The boot program distribution equipment concerning the gestalt of this operation is constituted by multiple address transmitting section 9b and packet retransmission-of-message section 9c with which the server 9 is equipped, and the multiple address receive section 11 and the re-receiving device 12 with which Clients 101-10n are equipped. Here, the retransmission-of-message authorization section 13 is contained in multiple address transmitting section 9b, and the re-receiving device 12 is constituted by the retransmission-of-message demand section 14 and the packet re-receive section 15.

[0067] In addition, the clients 101-10n in this drawing 2 are computers which start by the same boot program 7, and since they have same configuration and operation, they are mainly explained using a client 101 below.

[0068] If multiple address transmitting section 9b detects Clients [ 101-10n ] either starting, it will divide a boot program 7 into plurality, will create a packet, will attach identification information, and will transmit using broadcast. Here, the number of partitions and sequence of a boot program 7 are used as identification information. For example, when a boot program 7 is divided into 100 pieces, identification information "1/100", "2/100", —, "100/100" are added sequentially from a top packet, respectively.

[0069] Moreover, this multiple address transmitting section 9b transmits a retransmission-of-message enabling signal by broadcast with the retransmission-of-message authorization section 13, after transmitting all the created packets. This retransmission-of-message enabling signal is

a signal for notifying the purport which can broadcast a packet again.

[0070] It will be assigned to the client 101 by self being installed by the multiple address receive section 11, and when starting the client 101 currently assigned, it receives the packet transmitted by broadcast. Moreover, composition of a boot program 7 is tried from the packet which received. Here, when the packet of the abnormalities in a communication link in case abnormalities are in the contents of the packet which received when there was a packet which is not received [ for example, ] exists, a normal packet is inputted from the packet re-receive section 15, and a boot program 7 is compounded only by the normal packet. And the compounded boot program 7 is stored in memory 3a.

[0071] The retransmission-of-message demand section 14 receives the retransmission-of-message enabling signal transmitted by broadcast, when starting a client 101. Moreover, reception of this retransmission-of-message enabling signal detects whether the packet of the abnormalities in a communication link is in this packet with reference to the packet received in the multiple address receive section 11. And when there are abnormalities in a communication link, the identification information of the packet leading to this abnormality is included in a retransmission-of-message demand signal, and this retransmission-of-message demand signal is transmitted to packet retransmission-of-message section 9c of a server 9.

[0072] If a retransmission-of-message demand signal is received from the retransmission-of-message demand section 14, packet retransmission-of-message section 9c will read a boot program 7, and will create a packet by the same technique as multiple address transmitting section 9b. And the packet concerning the identification information contained in the received retransmission-of-message demand signal is transmitted to the packet re-receive section 15 of a client 101.

[0073] The packet re-receive section 15 receives a retransmission-of-message packet from packet retransmission-of-message section 9c, and outputs this retransmission-of-message packet that received to the multiple address receive section 11.

[0074] Actuation of the computing system 8 equipped with the boot program distribution equipment which has the above configurations is explained below.

[0075] Drawing 3 is drawing showing the actuation performed between server 2a of this computer system, and a client 101.

[0076] If a power source is newly switched on in Clients [ 101-10n ] either, first, a boot program 7 will be read by multiple address transmitting section 9b by the side of a server 9, and packet "1/100" - "100/100" will be created.

[0077] And if this packet "1/100" - "100/100" is transmitted by multiple address transmitting section 9b by the side of a server 9 using broadcast, it will be received in the multiple address receive section 11 by the side of a client 101. However, suppose that the packet "55/100" was lost at the time of this communication link.

[0078] Moreover, after packet "1/100" - "100/100" is transmitted by multiple address transmitting section 9b by the side of a server 9, the signal which can be broadcast again is transmitted from the retransmission-of-message authorization section 13 using broadcast.

[0079] Reception of the signal which can be broadcast again of the retransmission-of-message demand section 14 by the side of a client 101 lists the packet received by the multiple address receive section 11 by this retransmission-of-message demand section 14. Thereby, the purport which the packet "55/100" has lost is detected by the retransmission-of-message demand section 14.

[0080] Then, the retransmission-of-message demand signal of the purport which broadcasts a packet "55/100" again is transmitted by the retransmission-of-message demand section 14 by the side of a client 101.

[0081] A retransmission-of-message demand signal is received by the server 9 side, and packet retransmission-of-message section 9c retransmits a message to a packet "55/100" at it based on this retransmission-of-message demand signal.

[0082] It is received by the packet re-receive section 15, and the packet "55/100" to which it retransmitted a message at the client 101 side is outputted to the multiple address receive section 11 after that.

[0083] And the packet again received by the multiple address receive section 11 by the retransmission-of-message demand section 14 is listed, as a result, all reception is checked, and composition of a boot program 7 is made by the multiple address receive section 11.

[0084] As explained above, in the boot program distribution equipment concerning the gestalt of this operation, two or more packets are created from a boot program 7, and it transmits using broadcast. Here, when the packet which did not communicate normally is detected, a client 101 retransmits a message only to this packet that did not communicate normally from a server 9.

[0085] That is, this boot program distribution equipment requires only the packet in which this communication link failed of a server 9, when the communication link of a boot program 7 goes wrong partially. Here, the retransmission-of-message demand from a client 101 is performed after the retransmission-of-message authorization from a server 9 is transmitted.

[0086] Thus, what is necessary is not to repeat transmission of a boot program 7 two or more times, in order to secure a normal communication link, and to broadcast again only the packet by which the unusual communication link was made, if the boot program distribution equipment concerning the gestalt of this operation is used.

[0087] Therefore, in the boot program distribution equipment concerning the gestalt of this operation, traffic can be made to be able to reduce further rather than the case where the gestalt of the 1st operation describes, and the turbulence by the client 101 can be prevented. Moreover, thereby, the dependability of starting of a computing system can be raised further.

[0088] In addition, the signal in the gestalt of this operation which can be broadcast again may be used as "boot authorization" to the client which the communication link of a packet has completed normally.

[0089] Moreover, in the gestalt of this operation, it is supposed that the retransmission-of-message demand section 14 will detect transmitting abnormalities with reference to the identification information of the packet received by the multiple address receive section 11. However, it replaces with this and the both sides of the multiple address receive section 11 and the retransmission-of-message demand section 14 presuppose that it is a packet ability ready for receiving, and though the retransmission-of-message demand section 14 detects the abnormalities in a communication link using the identification information of the packet which self received, it is good.

[0090] In the gestalt of each above-mentioned implementation, although the case where it is built in the server and client from which each component of boot program distribution equipment constitutes a computer system is explained as an example, though it is not limited to this and external is carried out to a server and a client, it is good.

[0091] Moreover, in the gestalt of each above-mentioned implementation, although all are made into the transmission place of broadcast if it is the client which starts by the same boot program, it is not limited to this. For example, it is the client which starts by the same boot program, and it is good though a boot program is transmitted only for the client as which starting was required in predetermined time amount as an object of the transmission place of broadcast.

[0092] (Gestalt of the 3rd operation) As a program which a computer can be made to execute, write in storages, such as magnetic disks (a floppy disk, hard disk, etc.), optical disks (CD-ROM, DVD, etc.), and semiconductor memory, and it applies, or it transmits by communication media, and each function of the boot program distribution equipment concerning the gestalt of each operation explained above can also be applied to various equipments. The computer which realizes each above-mentioned function performs processing mentioned above by reading the program memorized by the storage and controlling actuation by the program.

[0093] For example, the 1st program which realizes the function of multiple address transmitting section 2b shown in drawing 1, and the 2nd program which realizes the function of multiple address receive section 3b are memorized to a storage.

[0094] If a user installs this 1st program in a server 2 and the 2nd program is installed in each clients 3-5, he can realize the same situation as the case where the boot program distribution equipment concerning the gestalt of the 1st operation is applied.

[0095] Moreover, the 3rd program which realizes the function of multiple address transmitting section 9b which contains the retransmission-of-message authorization section 13 shown in

drawing 2 , for example, the 4th program which realizes the function of packet retransmission-of-message section 9c, the 5th program which realizes the function of the multiple address receive section 11, and the 6th program which realizes the function of the re-receiving device 12 are memorized to a storage.

[0096] If a user installs these 3rd and 4th programs in a server 9 and the 5th and 6th programs are installed in each clients 101-10n, he can realize the same situation as the case where the boot program distribution equipment concerning the gestalt of the 2nd operation is applied.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** The block diagram showing the configuration of the computer system equipped with the boot program distribution equipment concerning the gestalt of operation of the 1st of this invention.

**[Drawing 2]** The block diagram showing the configuration of the computer system equipped with the boot program distribution equipment concerning the gestalt of operation of the 2nd of this invention.

**[Drawing 3]** Drawing showing the actuation performed between the servers of a computer system and clients equipped with the boot program distribution equipment concerning the gestalt of this operation.

**[Description of Notations]**

- 1 8 — Computing system
- 2 9 — Server
- 2a — Storage
- 2b, 11 — Multiple address transmitting section
- 3-5,101-10n — Client
- 3a-5a — Memory
- 3b-5b — Multiple address receive section
- 6 — Network
- 7 — Boot program
- 9c — Packet retransmission-of-message section
- 12 — Re-receiving device
- 13 — Retransmission-of-message authorization section
- 14 — Retransmission-of-message demand section
- 15 — Packet re-receive section

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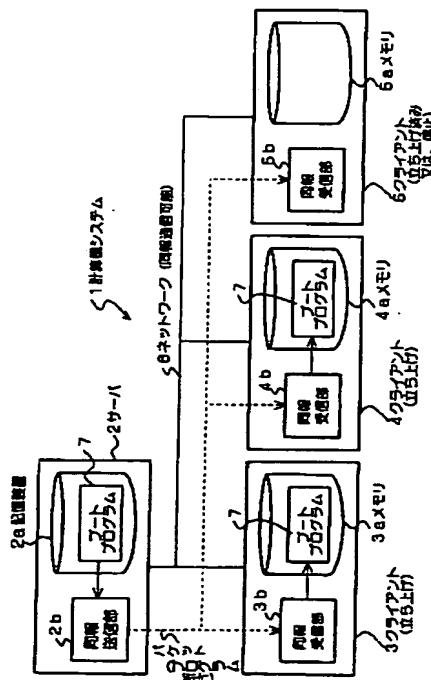
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(54)【発明の名称】 ブートプログラム配信装置及びプログラムを記憶したコンピュータ読み取り可能な記憶媒体

## (57)【要約】

【課題】ブートプログラムを複数のクライアントに同時に配信する際の効率化を図る。

【解決手段】ネットワーク6を介してサーバ2と接続されているクライアント3～5のうち、立ち上げを行うクライアントに対してもサーバ2の保持するブートプログラム7を配信するブートプログラム配信装置であって、クライアント3～5のいずれかにおける立ち上げを検出した際に、サーバ2の保持するブートプログラム7を同報通信により送信する同報送信手段2bと、各クライアント3～5に割り当てられ、この割り当てられているクライアント3～5を立ち上げる際に、同報送信手段2bによって送信されたブートプログラム7を受信する同報受信手段3b～5bとを具備したブートプログラム配信装置である。



## 【特許請求の範囲】

【請求項1】 ネットワークを介してサーバと接続されている少なくとも一つのクライアントのうち、立ち上げを行うクライアントに対して前記サーバの保持するブートプログラムを配信するブートプログラム配信装置であって、

前記少なくとも一つのクライアントのいずれかにおける立ち上げを検出した際に、前記サーバの保持するブートプログラムを同報通信により送信する同報送信手段と、前記少なくとも二つの各クライアントに割り当てられ、この割り当てられているクライアントを立ち上げる際に、前記同報送信手段によって送信されたブートプログラムを受信する少なくとも一つの同報受信手段とを具備したことを特徴とするブートプログラム配信装置。

【請求項2】 請求項1記載のブートプログラム配信装置であって、

前記同報送信手段は、前記少なくとも一つのクライアントのいずれかにおける立ち上げを検出した際に、前記ブートプログラムを同報通信により複数回送信することを特徴とするブートプログラム配信装置。

【請求項3】 ネットワークを介してサーバと接続されている少なくとも一つのクライアントのうち、立ち上げを行うクライアントに対して前記サーバの保持するブートプログラムを配信するブートプログラム配信装置であって、

前記少なくとも一つのクライアントのいずれかにおける立ち上げを検出した際に、前記サーバの保持するブートプログラムを分割して複数のパケットとし、同報通信により前記複数のパケットを送信する同報送信手段と、この同報送信手段による前記複数のパケットの送信が終了した際に、前記パケットの再送信が可能な旨を示す再送信可能信号を同報通信により送信する再送信許可手段と、

前記少なくとも一つの各クライアントに割り当てられ、この割り当てられているクライアントを立ち上げる際に、前記同報送信手段によって送信された複数のパケットを受信する少なくとも一つの同報受信手段と、

前記少なくとも一つの各クライアントに割り当てられ、前記再送信許可手段によって送信された再送信可能信号を受信した際に、自己と同一のクライアントに割り当てられている同報受信手段によって正常に受信されなかつたパケットの有無を検出し、正常に受信されなかつたパケットの再送信を要求する旨を示す再送信要求信号を送信する少なくとも一つの再送信要求手段と、

前記少なくとも一つの再送信要求手段のいずれかから再送信要求信号を受信した際に、この受信した再送信要求信号の示すパケットを送信するパケット再送信手段と、前記少なくとも一つの各クライアントに割り当てられ、自己と同一のクライアントに割り当てられている同報受信手段によって正常に受信されなかつたために前記パケ

ット再送信手段から再送信されたパケットを受信する少なくとも一つのパケット再受信手段とを具備したことを特徴とするブートプログラム配信装置。

【請求項4】 コンピュータに、少なくとも一つのクライアントのいずれかにおける立ち上げを検出した際に、サーバの保持するブートプログラムを同報通信により送信させる同報送信機能と、自己の割り当てられているクライアントを立ち上げる際に、前記同報送信機能によって送信されたブートプログラムを受信させる同報受信機能とを実現させるためのプログラムを記憶したコンピュータ読み取り可能な記憶媒体。

【請求項5】 請求項4記載のプログラムを記憶したコンピュータ読み取り可能な記憶媒体であって前記同報送信機能は、前記少なくとも一つのクライアントのいずれかにおける立ち上げを検出した際に、前記ブートプログラムを同報通信により複数回送信させることを特徴とするプログラムを記憶したコンピュータ読み取り可能な記憶媒体。

【請求項6】 コンピュータに、少なくとも一つのクライアントのいずれかにおける立ち上げを検出した際に、サーバの保持するブートプログラムを分割して複数のパケットとし、同報通信により前記複数のパケットを送信させる同報送信機能と、この同報送信機能による前記複数のパケットの送信が終了した際に、前記パケットの再送信が可能な旨を示す再送信可能信号を同報通信により送信させる再送信許可機能と、自己の割り当てられているクライアントを立ち上げる際に、前記同報送信機能によって送信された複数のパケットを受信させる同報受信機能と、前記再送信許可機能によって送信された再送信可能信号を受信した際に、前記同報受信機能によって正常に受信されなかつたパケットの有無を検出し、正常に受信されなかつたパケットの再送信を要求する旨を示す再送信要求信号を送信させる再送信要求機能と、前記再送信要求機能によって送信された再送信要求信号を受信した際に、この受信した再送信要求信号の示すパケットを送信させるパケット再送信機能と、前記同報受信機能によって正常に受信されなかつたために前記パケット再送信機能から再送信されたパケットを受信させるパケット再受信機能とを実現させるためのプログラムを記憶したコンピュータ読み取り可能な記憶媒体。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】 本発明は、計算機を立ち上げる場合にブートプログラム（立ち上げプログラム）をネットワークを介して転送するブートプログラム配信装置及びプログラムを記憶したコンピュータ読み取り可能な

記憶媒体に関する。

【0002】

【従来の技術】一般的な計算機は、立ち上げ処理を行うブートプログラムを予め保有しており、このような計算機は独自に立ち上げを行う。

【0003】これに対し、例えばX端末やディスクレス計算機、ネットワークコンピュータ（Network Computer）等のような一部の計算機は、CPUやメモリ等は備えているが、ブートプログラムを保持するハードディスクは備えていない。ゆえに、このような一部の計算機は、ネットワークを経由して別の計算機から立ち上げに必要なブートプログラムを取得する仕組みを持っている。このように、他の計算機からネットワークを介してブートプログラムを取得することを、ネットワークブートという。

【0004】通常のネットワークブートは、ブートプログラムを保持する計算機と、立ち上げを行う計算機との間で一対一通信を行うことで実行される。

【0005】また、このネットワークブートでは、立ち上げを行う計算機に正確なブートプログラムが配信されたか否かを調べるために、送信後の内容を再び受信側から送信側に返信する。

【0006】したがって、従来のネットワークブートに必要とされる通信量は、（1）式のように求められる。

【0007】通信量=ブートプログラム容量×立ち上げる計算機台数×（返信の分）2…（1）

【0008】

【発明が解決しようとする課題】上記のように、従来のネットワークブートでは、複数の計算機を同時に立ち上げる場合に、この複数の計算機とブートプログラムを保有する計算機との間でそれぞれ独立にブートプログラムの通信がなされる。

【0009】近年、様々な業界でコンピュータ化が図られており、その中には例えば業務の開始時間にあわせて複数の計算機のネットワークブートを同時にを行うことがある。

【0010】この場合において、これらの計算機が同じネットワークに接続されると、プログラム転送による負荷によりネットワークが飽和し、輻輳を起こす可能性がある。

【0011】ネットワークの輻輳は通信遅延の原因となる。また、ネットワークの輻輳が原因でブートプログラムの取得が失敗し、立ち上げが停止することもある。

【0012】本発明は、以上のような実情に鑑みてなされたもので、ブートプログラムを同報通信を用いて送受信することにより、ネットワークの輻輳を軽減し、ブートプログラム配信の高速化や信頼性向上を図るブートプログラム配信装置及びプログラムを記憶したコンピュータ読み取り可能な記憶媒体を提供することを目的とする。

【0013】

【課題を解決するための手段】本発明の骨子は、複数のクライアントに対して同報通信（broadcast）を利用してブートプログラムを配信する点にある。

【0014】以下、本発明を実現するにあたって講じた具体的手段について説明する。

【0015】第1の発明は、ネットワークを介してサーバと接続されている少なくとも一つのクライアントのうち、立ち上げを行うクライアントに対してサーバの保持するブートプログラムを配信するブートプログラム配信装置であって、少なくとも一つのクライアントのいずれかにおける立ち上げを検出した際に、サーバの保持するブートプログラムを同報通信により送信する同報送信手段と、少なくとも一つの各クライアントに割り当たられ、この割り当てられているクライアントを立ち上げる際に、同報送信手段によって送信されたブートプログラムを受信する少なくとも一つの同報受信手段とを具備したブートプログラム配信装置である。

【0016】この第1の発明のブートプログラム配信装置においては、立ち上げを行うクライアントに対して同報通信によりブートプログラムが提供される。

【0017】したがって、同時に複数のクライアントを立ち上げる場合でも、ブートプログラム配信に伴う通信量の増加を低減させることができる。

【0018】ゆえに、ネットワークの輻輳を軽減させ、クライアントの立ち上げを高速に行うことができる。また、ブートプログラム取得の信頼性を向上させることができる。

【0019】第2の発明は、第1の発明のブートプログラム配信装置であって、同報送信手段は、少なくとも一つのクライアントのいずれかにおける立ち上げを検出した際に、ブートプログラムを同報通信により複数回送信するブートプログラム配信装置である。

【0020】この第2の発明のブートプログラム配信装置においては、ブートプログラムが同報通信により複数回送信される。

【0021】これにより、最初の同報通信により正常にブートプログラムを受信できなくても、後の同報通信により正常にブートプログラムを受信できる。ゆえに、ブートプログラム取得の信頼性を一層向上させることができる。

【0022】また、あるクライアントの立ち上げから若干遅れて他のクライアントを立ち上げる場合であっても、この他のクライアントがブートプログラムを取得することができる。

【0023】第3の発明は、ネットワークを介してサーバと接続されている少なくとも一つのクライアントのうち、立ち上げを行うクライアントに対してサーバの保持するブートプログラムを配信するブートプログラム配信装置であって、少なくとも一つのクライアントのいずれ

かにおける立ち上げを検出した際に、サーバの保持するブートプログラムを分割して複数のパケットとし、同報通信により複数のパケットを送信する同報送信手段と、この同報送信手段による複数のパケットの送信が終了した際に、パケットの再送信が可能な旨を示す再送信可能信号を同報通信により送信する再送信許可手段と、少なくとも一つの各クライアントに割り当てられ、この割り当てられているクライアントを立ち上げる際に、同報送信手段によって送信された複数のパケットを受信する少なくとも一つの同報受信手段と、少なくとも一つの各クライアントに割り当てられ、再送信許可手段によって送信された再送信可能信号を受信した際に、自己と同一のクライアントに割り当てられている同報受信手段によって正常に受信されなかったパケットの有無を検出し、正常に受信されなかったパケットの再送信を要求する旨を示す再送信要求信号を送信する少なくとも一つの再送信要求手段と、少なくとも一つの再送信要求手段のいずれかから再送信要求信号を受信した際に、この受信した再送信要求信号の示すパケットを送信するパケット再送信手段と、少なくとも一つの各クライアントに割り当てられ、自己と同一のクライアントに割り当てられている同報受信手段によって正常に受信されなかったためにパケット再送信手段から再送信されたパケットを受信する少なくとも一つのパケット再受信手段とを具備したブートプログラム配信装置である。

【0024】この第3の発明のブートプログラム配信装置においては、ブートプログラムが複数のパケットに分割されてサーバからクライアントに送信されるが、正常にクライアント側に受信されなかったパケットのみが再送信される。

【0025】したがって、ブートプログラムの配信に異常が発生しても修復可能であるため、ブートプログラム取得の信頼性を一層向上させることができる。

【0026】さらに、ブートプログラムの配信に異常が発生してもパケット単位の通信で復旧がされるため、復旧作業に必要とされる通信量を低減させることができる。

【0027】第4乃至第6の発明は、それぞれ第1乃至第3の発明で説明したブートプログラム配信装置の機能をコンピュータにより実現するためのプログラムを記憶したコンピュータ読み取り可能な記憶媒体である。

【0028】このようなプログラムを記憶した記憶媒体を用いることによって、上述した機能を有していないサーバやクライアントに対しても、簡単に上述した機能を付加することができる。

【0029】

【発明の実施の形態】以下、図面を参照しながら本発明の実施の形態について説明する。

【0030】(第1の実施の形態) 本実施の形態においては、同一のブートプログラムで立ち上げがなされるク

ライアントをネットワークに接続し、このクライアントを立ち上げる場合にサーバのブートプログラムを同報通信(broadcast)を利用してクライアントに配信する装置について説明する。

【0031】なお、同報通信とは、ある一つの場所から複数の場所へ同一の情報やメッセージを同時に送る通信方式である。

【0032】図1は、本実施の形態に係るブートプログラム配信装置を備えた計算機システムの構成を示すブロック図である。

【0033】この計算機システム1は、サーバ2とクライアント3～5とが同報通信可能なネットワーク6を介して送受信可能に接続されて構成されている。

【0034】本実施の形態に係るブートプログラム配信装置は、サーバ2に備えられている同報送信部2bとクライアント3～5に備えられている同報受信部3b～5bによって構成されている。

【0035】サーバ2は、記憶装置2aと同報送信部2bと、サーバとしての機能を実現するためのその他の図示しない機能を備える。なお、この図示しない機能は、従来のサーバが備えている機能と同様の機能と考えてよく、例えばクライアント3～5のいずれかを立ち上げる旨を検出する機能等がある。

【0036】記憶装置2aは、クライアント3～5立ち上げ用のブートプログラム7を記憶する。

【0037】同報送信部2bは、サーバ2においてクライアント3～5のいずれかの立ち上げが検出された場合に、記憶装置2a内のブートプログラムを読み出してプログラム断片に分割し、パケットを作成する。そして、作成したパケットを同報通信を利用してクライアント3～5に送信する。

【0038】この同報送信部2bは、パケットの送受信の失敗に備えて、同一のパケットを複数回(例えば3回程度)送信する。なお、例えば立ち上げを行うクライアントの全てが立ち上がったことをユーザ等が確認した場合や立ち上げを行うクライアントの全てにブートプログラム7が配信されたことを確認した場合などには、その時点で同報送信部2bからのパケット送信を中止してもよい。

【0039】クライアント3～5は、例えばX端末やディスクレス計算機、ネットワークコンピュータ等のような自らがブートプログラムを保有していない計算機であり、それぞれが同一のブートプログラム7によって立ち上げられる計算機である。

【0040】各クライアント3～5は、それぞれメモリ3a～5aと同報受信部3b～5bと、ネットワークブートにより立ち上げられるクライアントとしての機能を実現するためのその他の図示しない機能を備える。なお、この図示しない機能は、従来のクライアントが備えている機能と同様の機能と考えてよく、例えば自己の立

ち上げが要求されている旨をサーバ2に通知する機能等がある。

【0041】メモリ3a～5aは、配信されたブートプログラム7を保持するための装置である。このメモリ3a～5aに格納されたブートプログラム7が実行されることで、各クライアント3～5の立ち上げがなされる。

【0042】同報受信部3b～5bは、個々が設置されることでそれぞれクライアント3～5に割り当てられた状態になっており、それぞれ割り当てられているクライアント3～5の立ち上げを行う場合に、同報通信により送信されたパケットを受信する。そして、受信したパケットからブートプログラム7を合成し、メモリ3a～5aに格納する。

【0043】また、同報受信部3b～5bは、同一のパケットを複数受信した場合には、ブートプログラム7合成の際に同一のパケットの中から正常なパケットを選択し、ブートプログラム7の合成を試みる。そして、正常にブートプログラム7が合成できた場合には、合成完了を同報送信部2bに通知する。

【0044】上記のような構成を有するブートプログラム配信装置を備えた計算機システム1の動作について以下に説明する。

【0045】例えば、業務の開始にともなってクライアント3、4の電源が新規に投入されたが、クライアント5は既に立ち上げ済み又は停止状態であるとする。

【0046】この場合、立ち上げを行うクライアント3、4によってブートプログラム7の取得要求がなされ、この取得要求がサーバ2に検出される。

【0047】すると、サーバ2の同報送信部2bが起動され、この同報送信部2bによって記憶装置2a内のブートプログラム7が読み込まれる。

【0048】この同報送信部2bに読み込まれたブートプログラム7は、複数に分解されてパケットが作成され、同報通信を用いて送信される。この同報通信は複数回実行される。

【0049】なお、この複数のパケットは、このブートプログラム7によって立ち上げがなされるクライアント3～5を対象として同報通信により送信される。このため、複数のパケットはクライアント3～5のいずれにおいても受信可能であるが、同報受信部3b～5bはそれぞれが割り当てられているクライアント3～5を立ち上げる場合にのみ複数のパケットの受信機能を発揮する。

【0050】したがって、複数のパケットは、立ち上げを行うクライアント3、4の同報受信部3b、4bにおいて受信される。

【0051】この同報受信部3b、4bでは、受信した複数のパケットに基づいてブートプログラム7が合成される。なお、合成の際に同一のパケットを複数受信している場合には、正常なパケットが選択され合成される。

【0052】このようにして同報受信部3b、4bによ

って合成されたブートプログラム7は、メモリ3a、3bに記憶される。

【0053】なお、それぞれ同報受信部3b、4bにおいてブートプログラム7が正常に合成された旨を検出させ、正常に合成された場合には、同報受信部3b、4bから同報送信部2bにブートプログラム7の合成完了を通知させる。同報送信部2bでは、ブートプログラム7の全ての取得要求元からこの合成完了の通知を受けると同報通信を停止する。

【0054】これにより、同報通信によりパケットを複数回送信する場合であっても、不要な通信をなくすことができる。

【0055】クライアント3、4は、このメモリ3a、3b内のブートプログラム7を用いて立ち上げを行う。

【0056】以上説明したように、本実施の形態に係るブートプログラム配信装置においては、同報送信部2bと同報受信部3b～5bとの間でブートプログラム7をネットワークを介して同報通信する。

【0057】このブートプログラム配信装置を用いてネットワークブートを行う場合に必要とされる通信量は、多い場合であっても(2)式のようになる。

【0058】

通信量=ブートプログラム容量×通信回数…(2)

この(2)式で求められる通信量は、(1)式で求められる従来のネットワークブートで必要とされる通信量よりも大幅に削減されている。

【0059】したがって、本実施の形態に係るブートプログラム配信装置を適用することで、ブートプログラムの転送によりネットワークが飽和し輻輳を起こすことを防止することができる。また、通信の遅延を防止することができ、ブートプログラム取得の異常やクライアントの立ち上げが失敗することを防止し、信頼性を向上させることができる。

【0060】また、本実施の形態に係るブートプログラム配信装置を適用すると、クライアントからサーバへの返信がなされないため、通信に対する擾乱を減らすことができ、ネットワークの仕様状況を向上させることができる。

【0061】さらに、本実施の形態に係るブートプログラム配信装置においては、ブートプログラムが複数回送信されるため、ブートプログラム配信の信頼性を一層向上させることができる。また、あるクライアントの立ち上げから若干遅れて他のクライアントを立ち上げる場合であっても、この他のクライアントがブートプログラムを取得することができる。

【0062】一方、ブートプログラムが正常に配信された場合には複数回の送信を完了する前であっても通信を停止させることにより、通信量を一層削減させることができる。

【0063】(第2の実施の形態)本実施の形態におい

ては、ブートプログラムを分割して作成された複数のパケットを同報通信により転送するが、転送時に異常が発生したパケットを検出し、この異常なパケットのみを再送信するブートプログラム配信装置について説明する。

【0064】図2は本実施の形態に係るブートプログラム配信装置を備えた計算機システムの構成を示すブロック図である。この図2において図1と同一の要素には同一の符号を付するとし、その説明を省略する。

【0065】計算機システム8は、サーバ9とクライアント101～10-nとがネットワーク6を介して送受信可能に接続されて構成されている。

【0066】本実施の形態に係るブートプログラム配信装置は、サーバ9に備えられている同報送信部9b及びパケット再送信部9cと、クライアント101～10nに備えられる同報受信部11及び再受信機構12とによって構成されている。ここで、同報送信部9bには再送信許可部13が含まれており、再受信機構12は再送信要求部14とパケット再受信部15とにより構成されている。

【0067】なお、この図2におけるクライアント101～10nは、同一のブートプログラム7で立ち上がる計算機であり、同様の構成・作用を有するため、以下においては主にクライアント101を用いて説明する。

【0068】同報送信部9bは、クライアント101～10nのいずれかの立ち上げを検出すると、ブートプログラム7を複数に分割してパケットを作成し、識別情報を付して同報通信を利用して送信する。ここでは、識別情報として、ブートプログラム7の分割数とその順序とを用いる。例えば、ブートプログラム7を100個に分割した場合には、それぞれ先頭のパケットから順に識別情報「1/100」、「2/100」、…、「100/100」が付加される。

【0069】また、この同報送信部9bは、作成したパケットを全て送信した後に、再送信許可部13によって再送信許可信号を同報通信により送信する。この再送信許可信号は、パケットの再送信が可能な旨を通知するための信号である。

【0070】同報受信部11は、自己が設置されることでクライアント101に割り当てられた状態になっており、割り当てられているクライアント101の立ち上げを行う場合に、同報通信により送信されたパケットを受信する。また、受信したパケットからブートプログラム7の合成を試みる。ここで、例えば未受信のパケットがある場合や受信したパケットの内容に異常のある場合などのような通信異常のパケットが存在した場合にはパケット再受信部15から正常なパケットを入力し、正常なパケットのみでブートプログラム7を合成する。そして、合成されたブートプログラム7をメモリ3aに格納する。

【0071】再送信要求部14は、クライアント101

の立ち上げを行う場合に、同報通信により送信された再送信許可信号を受信する。またこの再送信許可信号を受信すると、同報受信部11において受信されたパケットを参照し、このパケットの中に、通信異常のパケットがあるか否かを検出する。そして、通信異常がある場合には、この異常の原因となっているパケットの識別情報を再送信要求信号に含め、この再送信要求信号をサーバ9のパケット再送信部9cに送信する。

【0072】パケット再送信部9cは、再送信要求部14から再送信要求信号を受信すると、ブートプログラム7を読み込んで同報送信部9bと同様の手法でパケットを作成する。そして、受信した再送信要求信号に含まれている識別情報に係るパケットを、クライアント101のパケット再受信部15に送信する。

【0073】パケット再受信部15は、パケット再送信部9cから再送信パケットを受信し、この受信した再送信パケットを同報受信部11に出力する。

【0074】上記のような構成を有するブートプログラム配信装置を備えた計算機システム8の動作について以下に説明する。

【0075】図3は、この計算機システムのサーバ2aとクライアント101との間で行われる動作を示す図である。

【0076】クライアント101～10nのいずれかにおいて電源が新規投入されると、まずサーバ9側の同報送信部9bによってブートプログラム7が読み出され、パケット「1/100」～「100/100」が作成される。

【0077】そして、サーバ9側の同報送信部9bによってこのパケット「1/100」～「100/100」が同報通信を利用して送信されると、クライアント101側の同報受信部11において受信される。しかしながら、この通信時においてパケット「55/100」が紛失されたとする。

【0078】また、サーバ9側の同報送信部9bによってパケット「1/100」～「100/100」が送信された後には、再送信許可部13から再送信可能信号が同報通信を利用して送信される。

【0079】クライアント101側の再送信要求部14によって再送信可能信号が受信されると、この再送信要求部14によって同報受信部11に受信されたパケットがリストアップされる。これにより、パケット「55/100」が紛失されている旨が再送信要求部14によって検出される。

【0080】すると、クライアント101側の再送信要求部14によって、パケット「55/100」を再送信する旨の再送信要求信号が送信される。

【0081】サーバ9側においては、パケット再送信部9cによって再送信要求信号が受信され、この再送信要求信号に基づいてパケット「55/100」が再送信される。

【0082】クライアント101側においては、再送信されたパケット「55/100」がパケット再受信部15に受

信され、その後同報受信部11に出力される。

【0083】そして、再送信要求部14によって再び同報受信部11に受信されたパケットがリストアップされ、この結果全受信が確認され、同報受信部11によってブートプログラム7の合成がなされる。

【0084】以上説明したように、本実施の形態に係るブートプログラム配信装置においては、ブートプログラム7から複数のパケットを作成し、同報通信を利用して送信する。ここで、正常に通信されなかったパケットが検出された場合には、この正常に通信されなかったパケットのみがサーバ9からクライアント101に再送信される。

【0085】すなわち、このブートプログラム配信装置は、ブートプログラム7の通信を部分的に失敗した場合に、この通信の失敗したパケットのみをサーバ9に要求する。ここで、クライアント101からの再送信要求は、サーバ9からの再送信許可が送信されてから実行される。

【0086】このように、本実施の形態に係るブートプログラム配信装置を利用すると、正常な通信を確保するためにブートプログラム7の送信を複数回繰り返す必要がなく、異常な通信のなされたパケットのみを再送信すればよい。

【0087】ゆえに、本実施の形態に係るブートプログラム配信装置においては、第1の実施の形態で述べた場合よりも一層通信量を削減させることができ、クライアント101による擾乱を防止することができる。また、これにより計算機システムの立ち上げの信頼性を一層向上させることができる。

【0088】なお、本実施の形態における再送信可能信号は、正常にパケットの通信が完了しているクライアントに対して「ブート許可」として利用してもよい。

【0089】また、本実施の形態においては、同報受信部11によって受信されたパケットの識別情報を参照して再送信要求部14が送信異常を検出するとしている。しかし、これに代えて同報受信部11と再送信要求部14の双方がパケットを受信可能であるとし、再送信要求部14は自分が受信したパケットの識別情報を用いて通信異常を検出するとしてもよい。

【0090】上記各実施の形態においては、ブートプログラム配信装置の各構成要素が計算機システムを構成するサーバ及びクライアントに内蔵されている場合を例として説明しているが、これに限定されるものではなく、サーバ及びクライアントに外付けされるとしてもよい。

【0091】また、上記各実施の形態においては、同一のブートプログラムで立ち上がるクライアントであれば全てを同報通信の送信先としているが、これに限定されるものではない。例えば、同一のブートプログラムで立ち上がるクライアントであって、所定の時間内に立ち上げが要求されたクライアントのみを同報通信の送信先の

対象としてブートプログラムを送信するとしてもよい。

【0092】(第3の実施の形態)上記に説明した各実施の形態に係るブートプログラム配信装置の各機能は、コンピュータに実行させることのできるプログラムとして、例えば磁気ディスク(フロッピーディスク、ハードディスク等)、光ディスク(CD-ROM、DVD等)、半導体メモリなどの記憶媒体に書き込んで適用したり、通信媒体により伝送して各種装置に適用することも可能である。上記各機能を実現するコンピュータは、記憶媒体に記憶されたプログラムを読み込み、プログラムによって動作が制御されることにより、上述した処理を実行する。

【0093】例えば、図1に示す同報送信部2bの機能を実現する第1のプログラムと同報受信部3bの機能を実現する第2のプログラムとを記憶媒体に記憶する。

【0094】ユーザは、この第1のプログラムをサーバ2にインストールし、第2のプログラムを各クライアント3～5にインストールすれば、第1の実施の形態に係るブートプログラム配信装置を適用した場合と同様の状況が実現できる。

【0095】また、例えば、図2に示す再送信許可部13を含む同報送信部9bの機能を実現する第3のプログラム、パケット再送信部9cの機能を実現する第4のプログラム、同報受信部11の機能を実現する第5のプログラム、再受信機構12の機能を実現する第6のプログラムを記憶媒体に記憶する。

【0096】ユーザは、この第3及び第4のプログラムをサーバ9にインストールし、第5及び第6のプログラムを各クライアント101～10nにインストールすれば、第2の実施の形態に係るブートプログラム配信装置を適用した場合と同様の状況が実現できる。

【0097】

【発明の効果】以上詳記したように本発明においては、ブートプログラムを保持しないクライアントを立ち上げる際に、サーバからクライアントに同報通信を利用してブートプログラムを配信する。

【0098】これにより、同時に多数のクライアントを立ち上げなければならない場合に、各クライアントに個別にブートプログラムを配信するより通信量を減少させることができる。

【0099】したがって、ブートプログラム配信によってネットワークが飽和し、輻輳を起こすことを防止することができる。また、ネットワークの輻輳により通信の遅延が発生し、ブートプログラムの取得の失敗や立ち上げの停止が発生することを防止することができる。さらに、クライアント立ち上げのためのブートプログラム配信を高速に行うことができる。

【0100】また、本発明においては、同報通信を複数回繰り返すことで、一層クライアントの立ち上げの信頼性を向上させることができる。

【0101】さらに、本発明においては、ブートプログラムを複数に分けてパケットを作成し、この各パケットに識別情報を付加して同報通信により送信し、受信先でパケットの識別情報から通信異常を検出し、異常となつたパケットのみを再送信させる。

【0102】これにより、ブートプログラムの一部分の通信が失敗しても、その失敗した部分のみを再送すればよく、同報通信を行うのは1回のみでよい。ゆえに、クライアント及びサーバの処理量及び通信量を減少させることができ、クライアントによる擾乱を防止することができる。

【図面の簡単な説明】

【図1】本発明の第1の実施の形態に係るブートプログラム配信装置を備えた計算機システムの構成を示すプロック図。

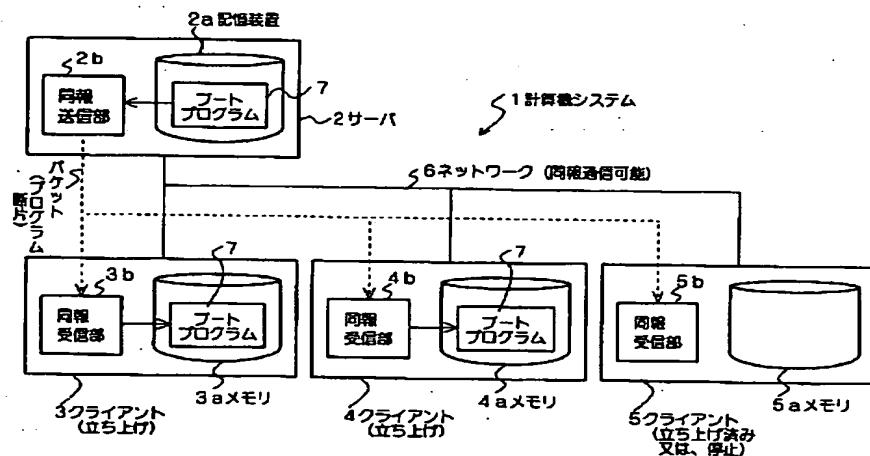
【図2】本発明の第2の実施の形態に係るブートプログラム配信装置を備えた計算機システムの構成を示すプロック図。

【図3】同実施の形態に係るブートプログラム配信装置を備えた計算機システムのサーバとクライアントとの間で行われる動作を示す図。

【符号の説明】

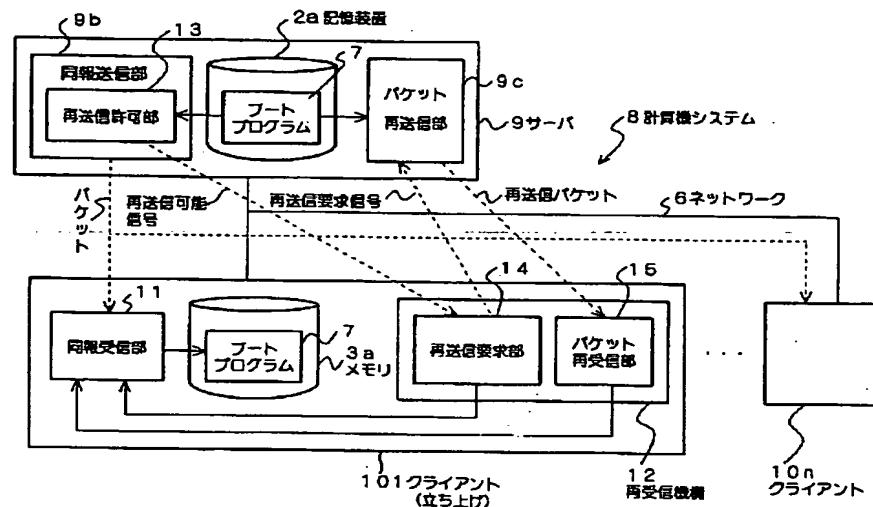
- 1、8…計算機システム
- 2、9…サーバ
- 2 a…記憶装置
- 2 b、11…同報送信部
- 3～5、101～10n…クライアント
- 3-a～5-a…メモリ
- 3 b～5 b…同報受信部
- 6…ネットワーク
- 7…ブートプログラム
- 9 c…パケット再送信部
- 12…再受信機構
- 13…再送信許可部
- 14…再送信要求部
- 15…パケット再受信部

【図1】

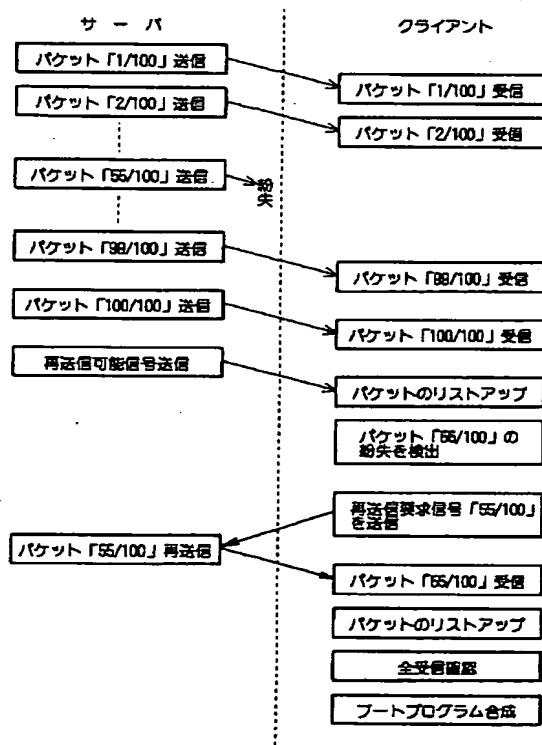


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【図2】



【図3】



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